nent diminution of volume. Some even retained their specific weight intact under extreme pressure.—Observations on M. van Beneden's last note respecting the discovery of fossil iguanodons at Bernissart, by E. Dupont. This communication closes the controversy.—Note on the literature of international law before the publication of Grotius's "Jus belli et pacis" (1625), part ii., by Alph. Rivier.—A literary study on the position of words in the Latin sentence, by J. Gantrelle.

Journal of the Russian Chemical and Physical Society, vol. xv. fasc. 8.—On dipropylacrylic acid, by A. Albitsky.—On the action of iodide of allyl and zinc on epichlorhydrine, by M. Lopatkin.—On an accessory product obtained during the preparation of diallyl carbinol, by W. Shestakoff.—On the action of iodide of allyl and of isobutyl on acetone, by A. Shatsky.—On the hydrocarbon C_8H_{14}, by S. Reformatsky.—On the refracting power of $C_{12}H_{20}$, by A. Albitzky.—Attempt of a theory of dissolutions, by W. Alexeyeff.—On $C_{21}H_{20}$ and the products of its oxidation, by W. Hemilian.—Analysis of a phosphorite from Nijni-Novgorod, by N. Lubavin.—On some phenomena of remanant magnetism, by P. Bakhmetieff.—On the changes in the galvanic resistance of selenium under the influence of light, by N. Hesehus. It depends chiefly upon allotropic dissociation of the molecules.—On the characters of the intramolecular force, by M. Bardsky, being a mathematical discussion of its dependence upon temperature.

Bulletin de l'Académie Impériale des Sciences de St. Pétersbourg, vol. xxviii. No. 4.—Demonstration of several propositions relative to the numerical function E(x), second paper, by V. Bouniakovsky.—Contributions towards palæontology, by M. Schmalhausen (with two plates); being a description of fossil plants of the Jura coal-basin of Kuznetsk, in the Altay (*Thyrsopteris prisca* and *Rhiptozamites gœpperti*), from North-West Mongolia, at the sources of the Yenisei, on the high plateau of the Ulu-khem (*Bornia radiata, Neuropteris cardiopteroides, Lepidodendron veltheimianum, Rhiptozamites gœpperti, Czekanowskia rigida*, and *Phœnicopsis angustifolia*), and from the Djün-khair-khan Mountains (*Asplenium argutulum* and *spectabile*, and *Czekanowskia rigida*).—On the sympathetic nervous system of the *Petromyzon*, by Ph. Owsiannikow.—On the camphor of the *Ledum palustre*, by M. Rizza.—Analyses of samples of water from thermal sources of Southern Altay (Byelukha-Rakhmanovka), and from a number of lakes and wells in the same region, by Prof. Carl Schmidt. Compared with thirty other thermal waters of Europe, Asia, New Zealand, &c. (the composition of which is given in a table), the Altay water shows a minimum of mineral substance.—Letter on natural history phenomena observed at the Lena Polar station, by Dr. Bunge.

Rendiconti of the Sessions of the Accademia delle Scienze di Bologna, March 14, 1883.—On a remarkable anatomical peculiarity observed in the eye of the swordfish (*Xiphias gladius*, L.) (one illustration), by Prof. G. V. Ciaccio.—Some observations on the *Mucor racemosus*, Fresenius, by Dr. F. Morini.

April 8.—A century of premature artificial births at the Lying-in Hospital of Bologna, by Dr. C. Belluzzi.—Chemical analysis of the meteorite which fell at Alfianello on February 16, 1883.—Researches on the *Phellandrium aquaticum*, by Dr. Leone Pesci.—Thermal and galvanometrical researches on the internal discharges of condensers, by Prof. E. Villari.—New studies on the polygenesis of crystallised minerals, by Prof. L. Bombicci.—Researches on the action of the magnet and of the thermal agents in hysterical hypnosis.—Observation on the series of functions, by Prof. C. Arzelà.—On the infinite products by analytical functions, by Prof. S. Piucherle.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, January 17.—"On the Electrolysis of Dilute Sulphuric Acid and other Hydrated Salts." By J. H. Gladstone and Alfred Tribe.

On March 1 last a communication was presented to the Royal Society by Prof. Frankland in which, among other things, the reactions the authors had described as taking place in the charging and discharging of secondary batteries were confirmed. Prof. Frankland expressed these reactions, however, by formulæ founded on the electrolysis, not of H_2SO_4, but of hexabasic sulphuric acid, H_6SO_6, in accordance with the views of Bourgoin.

The French chemist employed a divided cell, analysing the liquid in each compartment at the close of the experiment. He calls the increase of the acid in the positive compartment α, and concludes that 2α represents the amount of sulphuric acid electrolysed. This conclusion rests on the well-known theoretical views of Grotthuss, and, did his theory express all that goes on in the electrolytic processs, the method would readily discriminate between the actions represented by the following formulæ :—

	Before electrolysis		After electrolysis: Positive pole	After electrolysis: Negative pole
(1.)	SO_3H_2O	=	$SO_3 + O$	H_2
(2.)	$SO_3 3H_2O$	=	$SO_3 + O_3$	H_6
(3.)	$SO_3 nH_2O$	=	$SO_3 + O_n$	H_{2n}

But it was pointed out by Reuss, as far back as 1807, that, when electrolytic action occurs across a permeable diaphragm, a portion of the liquid may travel from the positive to the negative compartment of the compound cell by what is now called electrical endosmose. Daniell and Miller in 1844 pointed out that in electrolytic action there was also an unequal transference of the ions. Moreover, Daniell investigated the electrolysis of sulphuric acid of very different strengths by a similar method, and concluded that, for each equivalent of hydrogen liberated, the acid which passed across the diaphragm was not more than one-fourth nor less than one-fifth of an equivalent. Most of his experiments incline to the former. Did 2α, therefore, represent the amount of sulphuric acid electrolysed, it would appear from his results that *tetra-*, rather than *hexa-*, basic sulphuric acid was decomposed by the current. These discrepancies, both of observation and deduction, led the authors to make some experiments on the subject.

The apparatus employed consisted of a U-shaped tube of about 70 c.c. capacity, having a stop-cock in the centre of the horizontal part. The vertical parts of the apparatus were divided into millimetres, and the hole in the stop-cock packed with asbestos. The authors found that the closeness of the packing could be so nicely adjusted as to allow very little mechanical admixture of the fluids or electrical endosmose. In their experiments the current density was varied, and, unlike Bourgoin, they found that the increase of sulphuric acid in the positive compartment per equivalent of hydrogen set free decreased along with the decrease in the current density. The results are set out in the annexed table.

Current in milli-amperes	Time in hours	Increase of sulphuric acid in positive compartment for one part of hydrogen set free
32·8	20	9·17
33·4	6	9·5
72·3	2·5	10·3
72·7	2	9·4
106	2	11·0
117	2·5	10·5
215	1·5	12·05
220	1	12·04
229	2	12·31

It is necessary also to bear in mind the remarkable phenomenon called by the Germans "Wanderung der Ionen." Daniell long ago described an experiment in which he placed dilute sulphuric acid in the positive compartment and a solution of sulphate of copper in the negative. He found that when 15·5 grs. of copper had been deposited on the negative electrode there were 23 grs. of sulphuric acid in the same compartment. Now, as 15·5 grs. of copper are equivalent to 24 grs. of sulphuric acid, and as Bourgoin's formula allows for the formation of only half an equivalent of sulphuric acid, that is, 12 grs., it is evident that there was a considerable accumulation of that substance unaccounted for. In two similar experiments the authors obtained for 0·147 and 0·125 grm. of deposited copper 0·209 and 0·180 grm. of free sulphuric acid. The half equivalents would be 0·114 and 0·097 grm. respectively. If both compartments had been filled with sulphuric acid, some similar transference would doubtless have taken place, in addition to what is expressed in Grotthuss' chain of decomposition.

The authors conclude, therefore, that the method employed is incapable of determining whether it is H_2SO_4 or some hydrate which yields to the current.

Copper Sulphate

An examination of the chemical changes which accompany the electrolysis of a solution of copper sulphate appeared, how-

ever, capable of throwing additional light on the value of this electrolytic method. It is well known that water forms with $CuSO_4$ a definite hydrate, $CuSO_45H_2O$. Now, if in the electrolytic process the water of hydration suffers decomposition along with the $CuSO_4$, the primary chemical changes might be expected to be—

$$\text{(A.)}\quad \underbrace{CuSO_45H_2O = SO_3 + O_6}_{\text{Positive pole}} \quad \underbrace{Cu + 5H_2}_{\text{Negative pole}}.$$

But, if the water of hydration takes no more part in the electrolysis than the water of solution does, then the chemical changes would manifestly be—

$$\text{(B.)}\quad \underbrace{CuSO_4 = SO_3 + O}_{\text{Positive pole}} \quad \underbrace{Cu.}_{\text{Negative pole}}$$

Of course the collateral action—

$$\underbrace{H_2O = O}_{\text{Positive pole}} \quad \underbrace{H_2}_{\text{Negative pole}}$$

might also take place, but this would occur only with currents of considerable density. The method is obviously capable of discriminating between these two actions, even supposing a considerable quantity of the electrolyte travelled unchanged from one compartment of the apparatus to the other. For, in the first case, either free hydrogen would be liberated at the negative pole, or free acid formed in the negative compartment, equal to five-sixths of the total copper deposited; the free acid, and the five-sixths of the total copper, to which it is equivalent, being produced by the chemical action $5H_2 + 5CuSO_4 = Cu_5 + 5H_2SO_4$; equation A becoming—

$$CuSO_4, 5H_2O + 5CuSO_4 = \underbrace{SO_3 + O_6}_{\text{Positive pole}} \quad \underbrace{Cu_6 + 5H_2SO_4}_{\text{Negative pole}}.$$

On the other hand, if the action was in accordance with B there would be only a deposition of copper on the negative electrode, and no formation of free acid in the negative compartment. In the annexed table the results and particulars of the authors' experiments are set out:—

Experiment	Time in Hours	Free sulphuric acid: Pos. Compart.	Free sulphuric acid: Neg. Compart.
I.	1½	·0766	nil.
II.	2	·0936	nil.
III.	3	·1868	·0191
IV.	3	·1501	·0204
V.	3	·2442	·0237
VI.	3	·2546	·0372

In none of these experiments was there any trace of hydrogen visibly escaping from the negative electrode, while, as will be seen from the table, there was no free acid formed in the negative compartment till two hours or more had elapsed. By that time some admixture in the horizontal part of the apparatus might reasonably be expected, but even in the greatest instance it is small as compared with the amount of salt decomposed.

Similar experiments were made with the sulphate of zinc, with similar results, no hydrogen being evolved, and little or no sulphuric acid appearing in the negative compartment.

We conclude, therefore, that it is not possible to determine the composition, or even to show the presence of a hydrated salt in aqueous solution by means of this electrolytic method.

Zoological Society, February 5.—Prof. W. H. Flower, F.R.S., president, in the chair.—Mr. F. Day, F.Z.S., exhibited and made remarks on a specimen of a Dog-fish, of which the entire interior had been eaten out by Isopod Crustaceans of the genus Conilera.—Mr. G. F. Butt, F.Z.S., exhibited two specimens of a singular variety of the Red Grouse, shot in Westmoreland.—A communication was read from Mr. W. Leche, of the University of Stockholm, in which he gave an account of a collection of bats from Australia. Two new species were described and named respectively *Nyctinomus petersi* and *N. albidus*.—Mr. Sclater read some notes on the Lesser Koodoo (*Strepsiceros imberbis* of Blyth), with a view of confirming the distinctness of this Antelope from its larger relative, *Strepsiceros kudu*.—A communication was read from Mr. R. Bowdler Sharpe, containing the description of a new species of Bush-Shrike of the genus Laniarius, based on a specimen obtained in Ashantee by Mr. Godfrey Lagden, which he proposed to call *L. lagdeni*, after its discoverer.—Prof. Flower made some remarks on the chief points of interest exhibited by the Burmese Elephant now in the Society's Gardens.

Geological Society, February 6.—J. W. Hulke, F.R.S., president, in the chair.—Edward John Dunn was elected a Fellow, and Dr. Joseph Szabó, of Buda-Pest, a Foreign Member of the Society.—A delta in miniature—twenty-seven years' work, by T. Mellard Reade, F.G.S. The author described a delta deposit, which, during a period of twenty-seven years, had formed in the Rake reservoir (Rivington Waterworks) from materials brought down by a stream of that name. The reservoir at this part was divided by a road, water communication being maintained by a culvert, once eight feet high, now almost silted up. The author described the stratification of these deltas: that near the influx of the Rake consisted of peaty matter, gritty sand, gravel, shingle, and boulders of Millstone-grit up to about one foot diameter; the other chiefly of fine sand with some peaty matter. The former covered an area of 2508 yards, with an average thickness of 2 yards; the latter, an area of 430 yards, with an average thickness of 3 yards. These materials had come from the drainage-area of the Rake. This is estimated as 1·176 square mile, and the delta being estimated at 6306 cubic yards, and the time being 27 years, gives, as the annual rate of denudation over the whole area, 1/432 inch per annum, or 1 foot in 5184 years. The mean rainfall of the Rake Brook watershed for the last ten years was 49·57 inches per annum. In this calculation no account is taken of the finer materials which have doubtless been distributed over the rest of the bed of the reservoir. The author pointed out that this rate of denudation was rather more rapid than that of the Mississippi (1 foot in 6000 years), and that the arrangement of the materials under the varying condition of the stream illustrated the phenomena of larger deltas.—On the nature and relations of the Jurassic deposits which underlie London, by Prof. John W. Judd, F.R.S., Sec.G.S., with an introductory note on a deep boring at Richmond, Surrey, by Collett Homersham, A.M.Inst.C.E., F.G.S. An account of this appeared in NATURE, vol. xxix. p. 329.

SYDNEY

Linnean Society of New South Wales, December 27, 1883.—C. S. Wilkinson, F.G.S., F.L.S., president, in the chair.—The following papers were read:—On the localities of some plants from the southern parts of New South Wales, by Baron von Müller, K.C.M.G., F.R.S., &c.—Descriptions of Australian Microlepidoptera, No. 10, by E. Meyrick, B.A. This is a continuation of the Œccophoridæ of Australia, and deals with the genera *Philobota*, *Leistomorpha*, *Compsotropha*, and *Eriodyta*. About seventy new species are described.—Notes on the geology of the southern portion of the Clarence River basin, by Prof. Stephens. This was an account of the sugar lands of the Clarence, explaining the mode of their formation, and their relation to the Coal-measures which underlie them unconformably. The period of deposition of these latter rocks was also considered, and their immediate superposition upon the vertical Siluro-Devonian slates and quartzites described. The existence of a great north and south fault at the present outcrop of these rocks was demonstrated, and the probable existence of others near the present coast-line supported by various considerations.

PARIS

Academy of Sciences, February 11.—M. Rolland in the chair.—Note on Faraday's law (continued), by M. Ad. Wurtz.—Remarks on the slight horizontal and vertical vibrations of the ground observed at Abbadia, near Hendaye, for several years past, by M. d'Abbadie.—Note on the meteorite which fell at Grossliebenthal, near Odessa, on November 7/19, 1881, by M. Daubrée. In its outward appearance and microscopic structure it presents all the characters of the typical meteorite which fell at Lucé, Sarthe, on September 13, 1768, and which is already represented in the collection of the Natural History Museum, Paris, by fifty-four other identical specimens.—Description of an absolute calculating actinometer invented by M. G. A. Hirn. This delicate instrument is based on the principle of steam condensers, that a saturated vapour contained in a closed vessel acquires a tension corresponding with the minimum temperature of the walls of the receptacle. So far it acts with perfect satisfaction, and the inventor will report the numerical results as soon as he feels that they are absolutely trustworthy.—Report on the thunderstorms observed in France during the first six months of the year 1883, with complete and detailed tables of all the accidents caused by lightning in every part of the country during that period, communicated by the Minister of the Postal and Telegraph Department. The fatalities amounted altogether to nine persons and seventy-eight animals killed, and about fifty

persons and seven animals injured, by lightning.—Report on the solar spots and faculæ observed at Rome during the year 1883, by M. P. Tacchini. The paper is accompanied by a table of dates, relative size, frequency, and number of the spots.—Observations on the Pons-Brooks comet at the Observatory of Nice, one illustration, by M. Perrotin.—Note on the appearance of the same comet on January 13 and 19, 1884, by M. Perrotin. —On the sudden modifications of form (wings, egrets, &c.), presented by the same comet during its passage through perihelion, by M. G. Rayet.—On the barometric disturbances caused by the Krakatoa eruption, as recorded by the Rédier barometer of the Observatory of Toulouse, by M. Baillaud. —On linear substitutions (mathematical analysis), by M. H. Poincaré.—Generalisation of Jacobi's theorem on the Hamilton equations, by M. J. Farkas.—On curves of the fourth order, by M. C. Le Paige.—On the propagation of light in a crystallised medium, by Madame Sophie Kowalevski.—On the distribution of potential in a liquid mass having the form of an indefinite rectangular prism, by MM. Appell and Chervet.—On Joule's electric law, by M. P. Garbe.—On the electric conductibility of greatly diluted saline solutions, by M. E. Bouty.—Note on several unsuccessful attempts recently made to liquefy hydrogen, by M. K. Olszewski. These experiments are reported in consequence of M. Wroblewski's statement that he has succeeded in liquefying hydrogen by expansion at a temperature of −186° C. by means of boiling hydrogen.—On a gas-burner yielding a white light by the incandescence of magnesia, by M. Ch. Clamond.—On the law of the thermic constants of substitution (thermo-chemistry), by M. D. Tommasi.—On the formation of the iodide of methyl and of the iodide of methylene by means of iodoform, by M. P. Cazeneuve.—Note on the monobromic methylchloroform $CCl_3 - CH_2Br$, by M. L. Henry. —On the albuminoid substances contained in milk, especially caseine, by M. E. Duclaux.—Fresh observations on the morphology, anatomy, and development of the parasites of the onion and other bulbous plants (*Tylenchus hyacinthi, Tylenchus putrefaciens*, &c.), by M. Joannès Chatin.—Remarks on the preparation of farmyard manure, by M. P. P. Dehérain.—On the presence of pegmatite in the diamantiferous sands of South Africa; observations in connection with M. Chaper's recent communication on the subject, by M. Stan. Meunier.—On some freshwater formations during the old and recent Quaternary periods, by M. Ph. Thomas.—On the arched waterspouts of the Indian Ocean (two illustrations), by M. Le Goarant de Tromelin.—Note on the particles of dust found in the snow that fell at Stockholm last December, by M. E. Yung.—Actinometric observations made at Montpellier during the year 1883, by M. A. Crova.

February 18.—M. Rolland in the chair.—Observations of the small planets made with the large meridian at the Observatory of Paris during the third and fourth quarters of the year 1883, communicated by M. Mouchez.—On the reciprocal displacements between fluorhydric and the other acids, by MM. Berthelot and Guntz.—On the law of modules or thermic constants of substitution, by M. Berthelot.—Remarks on a note by M. J. Luvini in connection with the controversies carried on in the eighteenth century on the subject of waterspouts and whirlwinds, by M. Faye.—Determination of the difference of longitude between Paris and the Observatory of Bordeaux, by MM. G. Rayet and Salats. The longitude of the meridian of the Bordeaux Observatory, as here rectified, is fixed at 11m. 26·444s. ± 0·008s.—Remarks in connection with the recent researches made on the propagation of the atmospheric currents caused by the eruptions of Krakatoa, by M. Foerster. The author disclaims priority for the observations made by him on this phenomenon, a priority which he awards to General Strachey, whose paper on the subject appeared in a recent number of NATURE (p. 181). — On the divisors of certain polynomes, and on the existence of certain primary numbers, by M. A. Genocchi.—On the composition of such polynomes as admit only of primary divisors of a determined form, by M. Lefébure.—On certain linear substitutions (mathematical analysis), by M. E. Picard.—On an equation of the *m* degree, which has never more than two real roots, by M. D. André.—On a differential equation of the third order, by M. E. Goursat.—On M. Levy's elastic curve, expressing the equilibrium of an elastic circular rod subjected to normal and uniform pressure throughout its whole length, by M. Halphen.—On the adiabatic expansion of the vapour of water, by M. Paul Charpentier.—Researches on the fluorhydrate of fluoride of potassium, and on its states of equilibrium in various solutions, by M. Guntz.—On the nitrous derivatives of hydride of ethylene, by M. A. Villiers.—On the probable number of homologous and isomerous rosanilines, by MM. A. Rosenstiehl and M. Gerber.—On a new compound arising from the preparation of the hexachloride of benzine, having the same centesimal composition as that substance, by M. J. Meunier. —On the constitution of milk, by M. E. Duclaux. The author reduces milk by a new method of analysis to the following elements:—

	In suspension	In solution
Fatty substance	3·32 ...	—
Sugar of milk	— ...	4·98
Caseine	3·31 ...	0·84
Phosphate of lime	0·22 ...	0·14
Soluble salts	— ...	0·39
	6·75	6·35

—On the pigmentary function in the Hirudineæ (common leech, Nephelis, *Aulostoma vorax*, &c.), by M. Rémy Saint-Loup.—On the physiological development of the adult Comatule, by M. Edm. Perrier.—On a placentoid organ in the embryo of birds, by M. Mathias Duval.—Origin and mode of formation of the Belgian Devonian and Carboniferous limestones, by M. E. Dupont. The author explains the formation of the older marine rocks of organic origin by causes still in operation, and from this deduces a fresh proof of the value of the comparative method applied to the study of the past geological history of the globe. —On the variability of the composition and concentration of mineral waters, by M. A. Inostranzeff.

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